Operational Risk Management: A Practical Approach and its Regulatory Implications

Federal Reserve Bank of Boston

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Operational Risk: Is a change required?

Command and Control	Inspire and Lead
Branch Operating Manual Mandated Controls Audit Monitoring resolutions of audit findings Operational Risk is managed through better controls and better audit process	Guiding Principles Boundaries Structured Self Assessments of Risk Monitoring of OP Risk Levels Operational Risk is managed through better risk identification and transparency of risk taken
Managing Operational Risk Based on doing more of the same only better	A New Paradigm for Managing Operational Risk Based on $ at Risk

Under The New Paradigm

To Effective Manage Op Risk Business Leaders need to be able to know how much $ are at Risk? More precisely answer these questions

At Bank
At SBU
At BU
at BL

- What are my biggest operational risk?
- What hits can I expect my P&L to take from my biggest operational risk?
- How bad can those hits get?
- How bad can those hits really get?
- How will changes to my business strategy or control environment affect those hits
- How do my potential hits compare internally or externally

How is operational risk measured

Objective of Measuring Operational Risk

- Provide an accurate view of the operational risk profile of the business over the next 12 months.
  - What is the expected losses from operational risk
  - What is the Worst Case Loss from operational risk
- Supports the analysis of Operational Risk
  - What are the top Op Risk
  - What is the Worst case loss under stress conditions
  - How will changes to my business strategy or control environment affect the potential.
  - How does the potential hit compare with other business units or other banks

Measuring Operational Risk For better Management

Based on analytic techniques widely used in the insurance industry to measure the financial impact of an operational failure

- **The foundation is**
  - **the historical operational loss experience**
  - **deep understanding of what and why is at risk**
- **The edifice is business judgement**
  - similar to putting together a business plan
  - judgement is used to supplement/ replace or enhance historical loss experience based inputs
  - follows the same rigorous process as if all the inputs were historical loss data

- The measure is called OP VaR

- used for determining
  - the expected loss from operational failures
  - the worst case loss at confidence level
  - the required economic and regulatory operational risk capital
  - concentration of operational risk

First Step
Recognise Distinct Operational Risk Losses Types

1. **Legal Liability**:

   inlcudes client, employee and other third party lawsuits

2. **Regulatory, Compliance and Taxation Penalties**

   fines, or the cost of any other penalties, such as license revocations and associated costs - excludes lost / forgone revenue.

3. **Loss of or Damage to Assets**:

   reduction in value of the firm's non-financial asset and property

4. **Client Restitution**

   includes restitution payments (principal and/or interest) or other compensation to clients.

5. **Theft, Fraud and Unauthorized Activities**

   includes rogue trading

6. **Transaction Processing Risk**

   includes failed or late settlement, wrong amount or wrong counterparty

For a line of business and loss type: The worst case loss (WCL) over the next 12 months

WCL	=	**Expected Losses x γ**
	=	**Expected no of Losses x Average Loss x γ**

Expected no of losses	**the average number of legal liability, or transaction errors, or frauds etc over the next 12 months.**
Average Loss	**the average amount lost per legal liability, or per transaction error, or per frauds etc over the next 12 months**
γ	**Factor to convert the expected loss to worst case loss**

WCL Expressed in terms of Components of Expected Losses and Average Loss

WCL	=	**Expected losses x γ**
		Expected no of Losses x Average Loss x γ
	=	**E_f x PE $_f$ x E_s x LGE x γ**

E_f = **Exposure for no of losses**
eg no transactions, no of accounts, no of employees

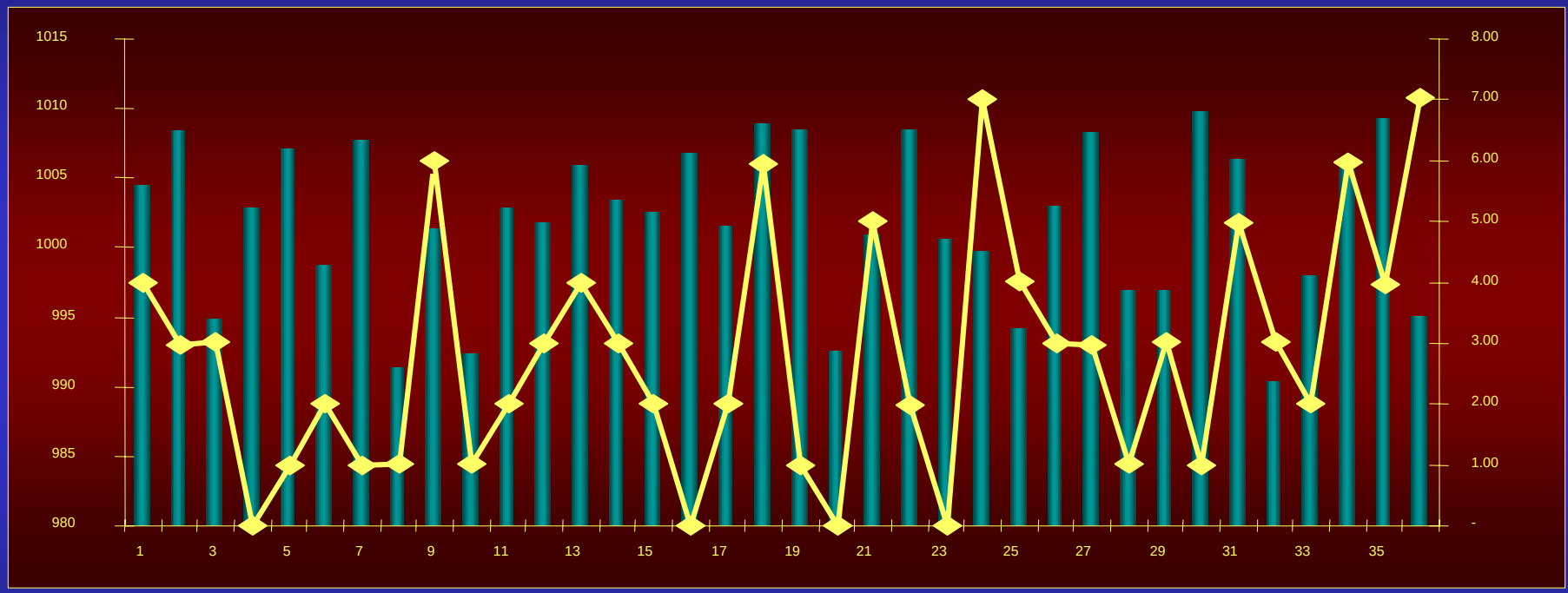
PE = **Expected Probability of an operational risk loss**
eg Expected number of loss / the number of transactions

E_s = **Exposure for loss amount**
eg Avg transactions value, Avg accounts value, Avg employee compensation

LGE = **Average Loss Given Event Rate**
eg average loss / Avg transactions value

γ = **Factor to convert the expected loss to worst case loss**

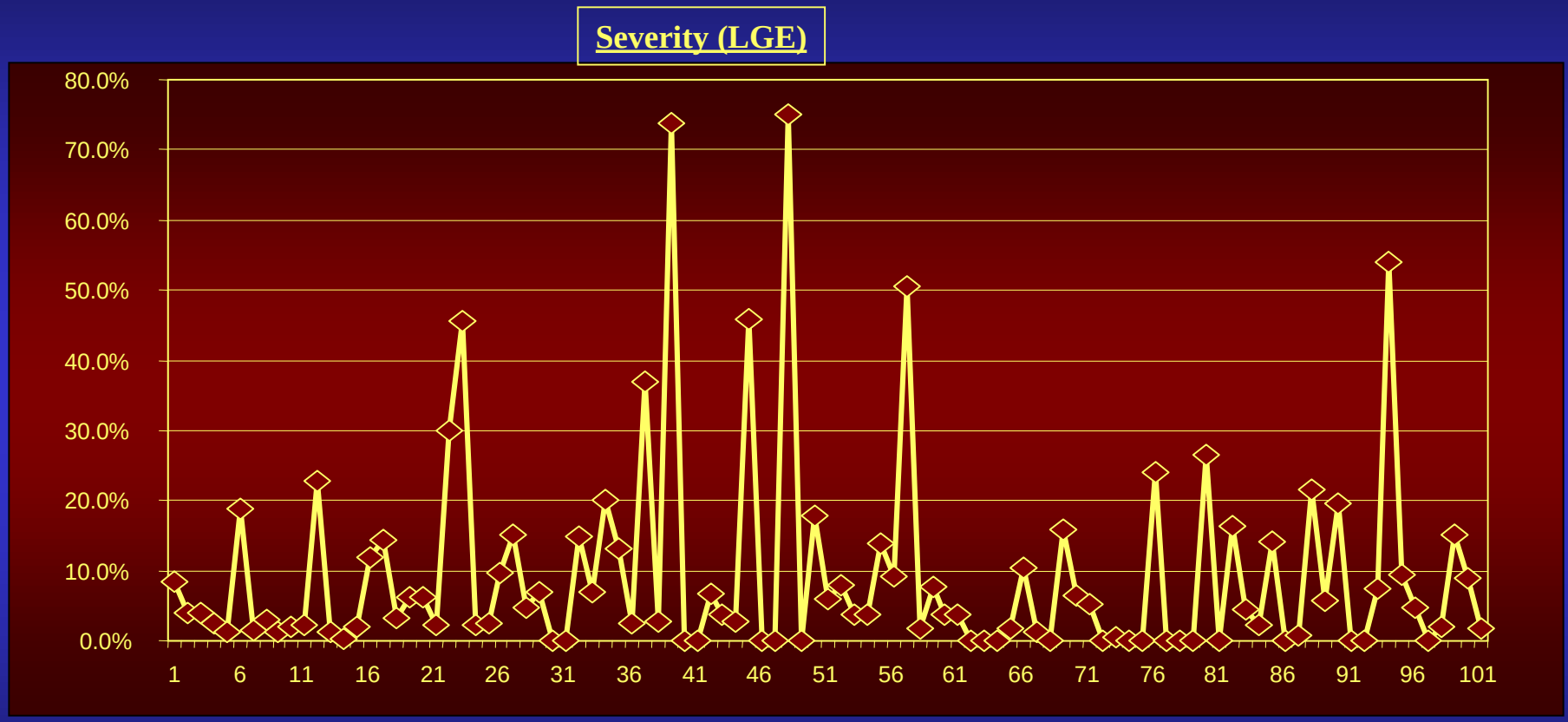
Op Risk Measurement Process
Calculation of the Frequency (PE)



No of losses/ no of trades

PE = 2.8 per 10,000 Trades
can be desegregated for different type of trades or trade processing systems)

Op Risk Measurement Process
Calculation of the Severity (LGE)

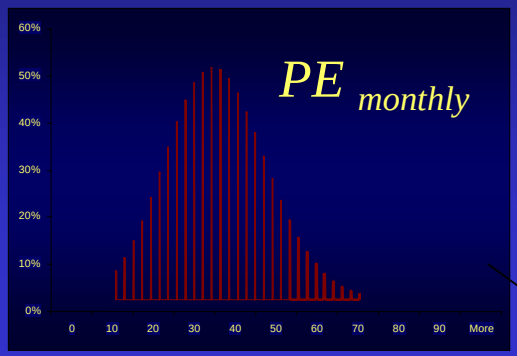


Amount of loss /average trade amount

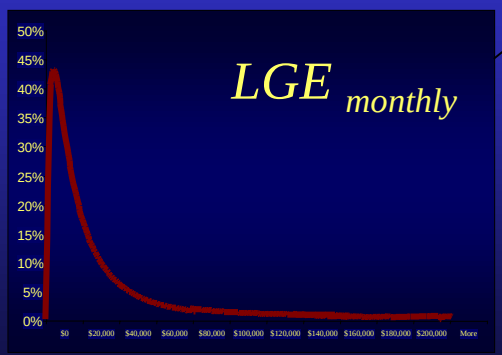
LGE = 9.8 % of Avg. Trade Value

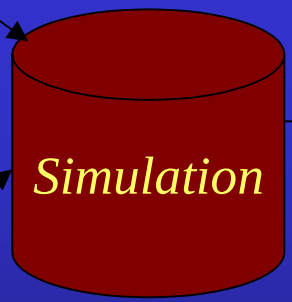
Statistical Distributions and Simulate

Function and Parameters



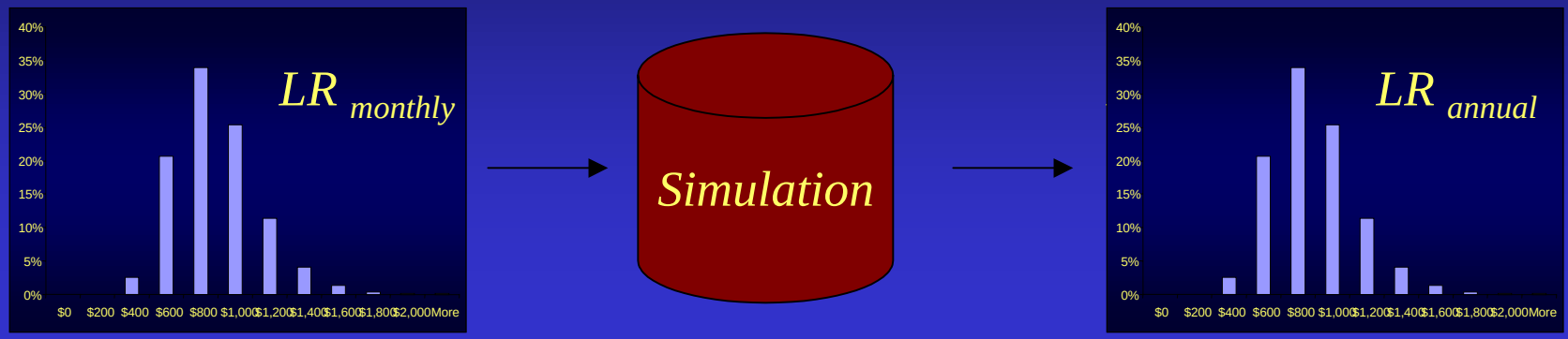
Function	Poisson
Mean PE	2.8 losses per 10,000 transactions
Std PE	2 events 10,000 transactions





Function	LogNormal
Mean LGE	9.8 %
Std PE	15%

Annualize the Losses And Estimate Exposure



Av Loss Rate	8%
WCL	40%
Gamma	5

With an Exposure of $10mm the expected loss is $.8mm ($10mm x 8%) and the worst case loss is $4mm ($10mm x 40%)

How Credible is the Result

- Compare the PE and LGE derived from internal loss history with industry PE and LGE

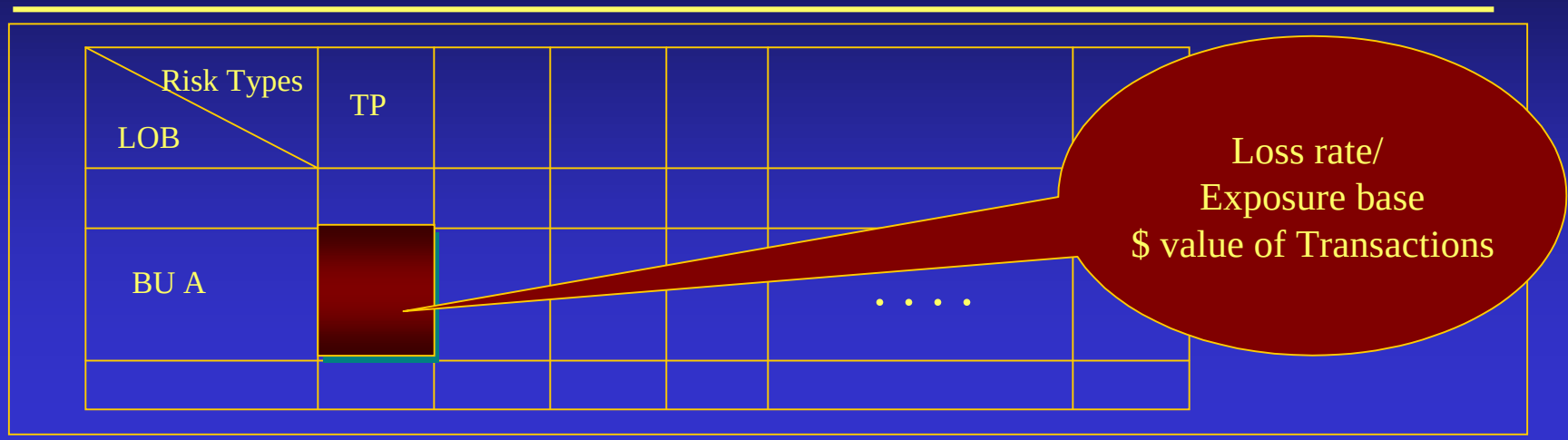
  Example

  - if external loss history shows one event per month
    - the internal loss history of 36 months is sufficient to determine with confidence the actual PE
  - if external loss history shows one event in 10 years
    - the internal loss history of 36 months is not sufficient to determine with confidence the actual PE or the internally calculated PE is not credible
  - When internal data is not credible, then the

$$\text{actual PE} = z_i \, PE_i + z_e PE_e$$

  - Z are credibility factors and there are standard statistical methods for determining Z's

Using external data
Insufficient internal loss data is supplemented with industry loss data



Firm Specific Risk

TP

derived from internal data

8%

$Value of Transactions

General Industry Risk

TP

derived from industry data

12%

$ Value of Transactions

Capital = $Value of Transactions x (specific loss rate+ general loss rate) x γ

$4mm = $ 10,000m x { (Z)(8%) + (1-Z) (12%)} 5 Z = 1

$4.6mm Z = .7

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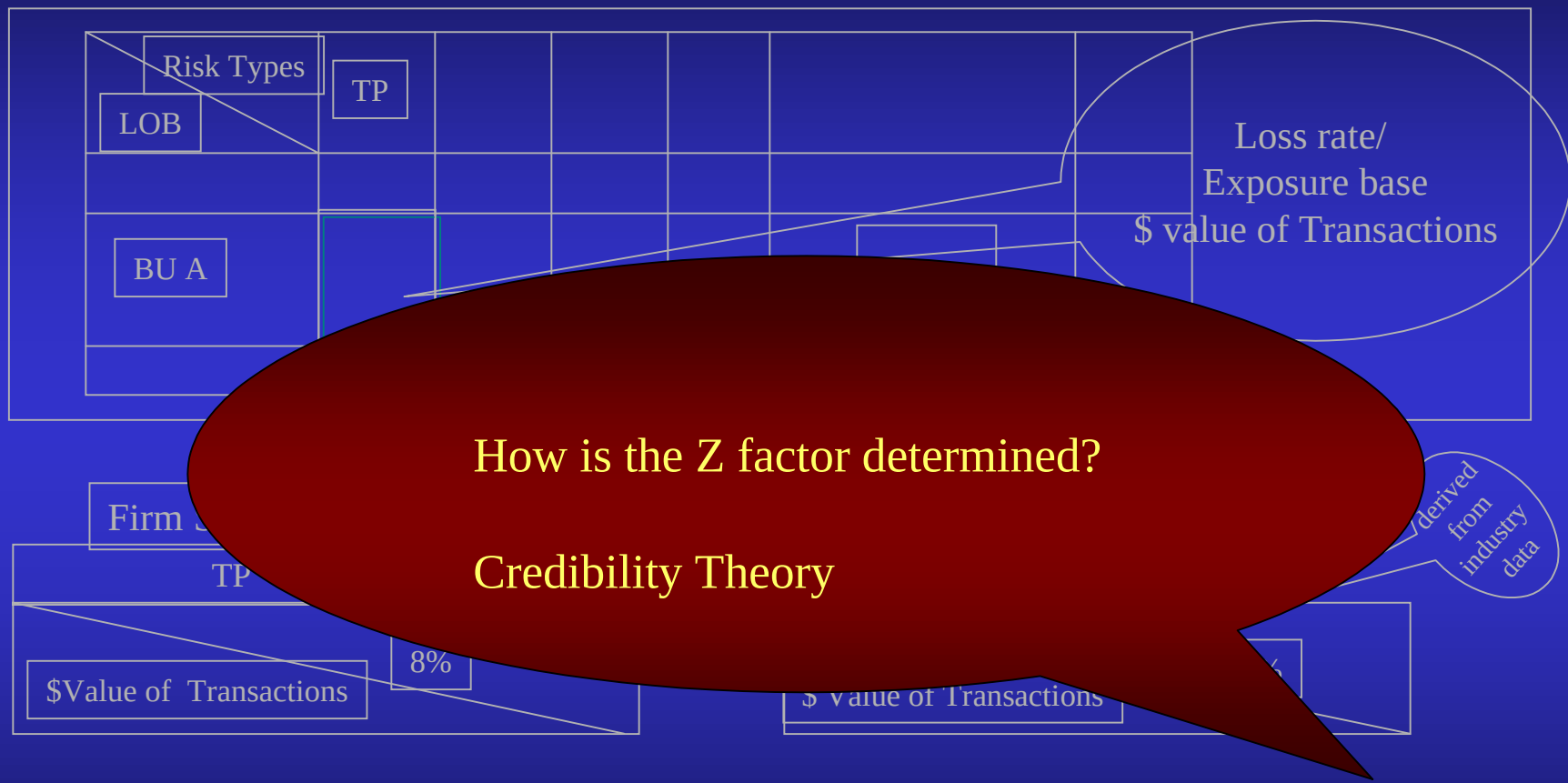
Insufficient internal loss data is supplemented with industry loss data



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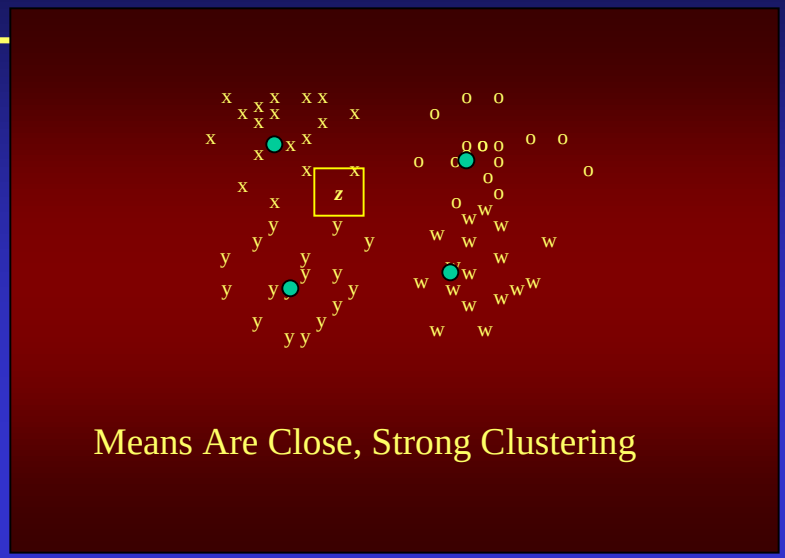
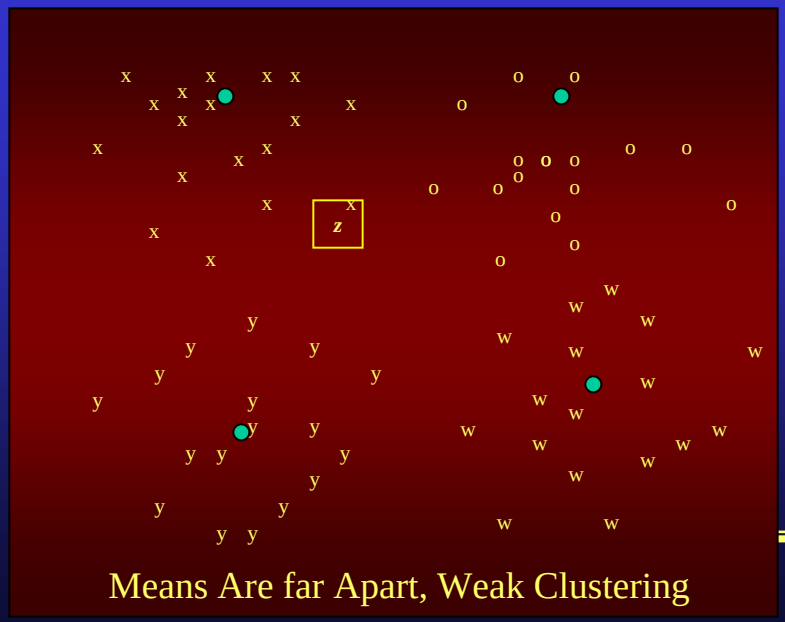
Credibility

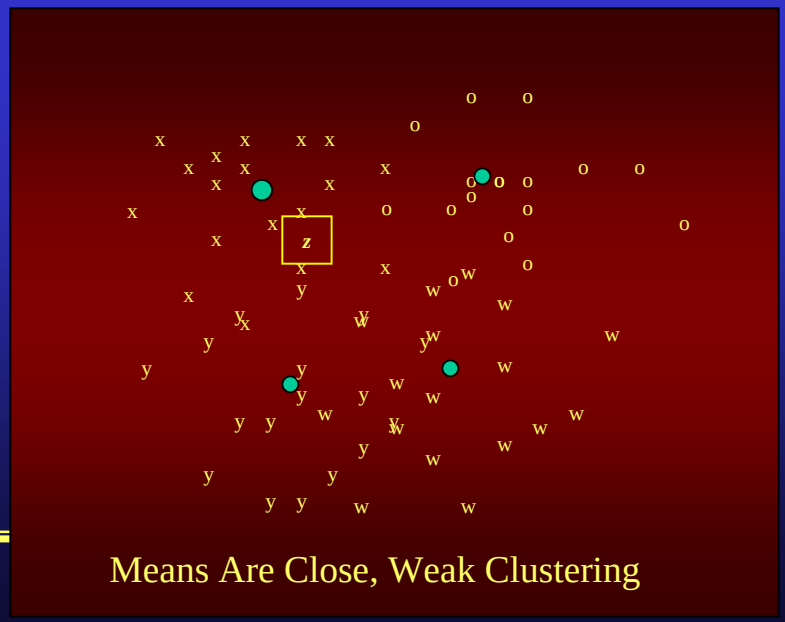
Means Are far Apart, Strong Clustering



Means Are Close, Strong Clustering



Means Are far Apart, Weak Clustering



Means Are Close, Weak Clustering

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  - When internal data is not credible, then the

$$\text{Credible PE} = z_i\, PE_i + z_e PE_e$$

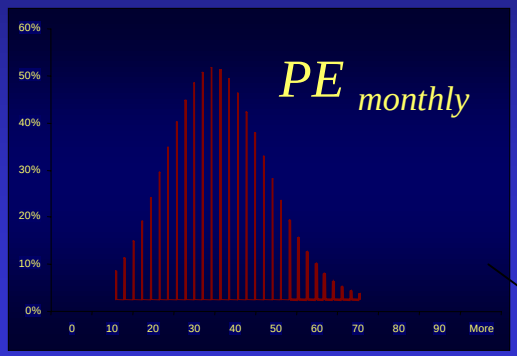
  - There are credibility factors and there are standard statistical methods for determining Z's

What happens when external data is insufficient

Scenario Analysis

Function and Parameters

These are estimated using Business and Risk Management Judgement



Function	Poisson
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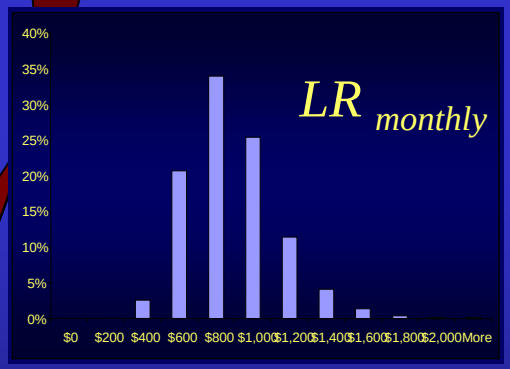
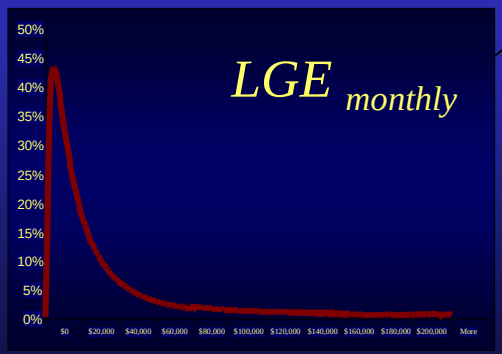
Simulation





Function	LogNormal
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Std PE	15%

Incorporating Scenario Analysis

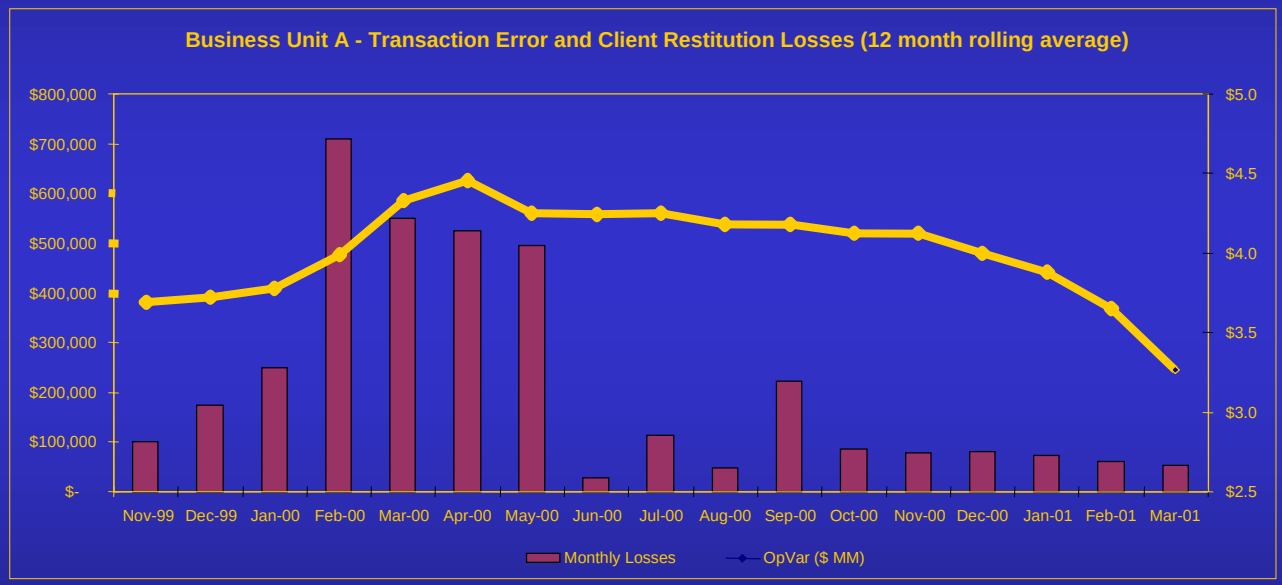
$$\text{actual PE} = z_i\,PE_i + z_e PE_e + z_s PE_s$$

These are estimated using Statistics

These are estimated using Business and Risk Management Judgement

Op VaR Reflects Changes in PE and LE over time

- Business Unit A



- Note the Lag
- How is Δ BCE incorporated

Use Qualitative Adjustments

KRD's: Key Risk Drivers

- Used to monitor changes operational risk for each business and for each loss type **before** the change in loss experience can be observed (ie lag and low frequency events)
- Incorporated into Op VaR, by modifying the risk determined by loss history and can be used to reward and punish for positive or negative changes in risk profile
- Objective standard measure eg a standard score
- Needs to be developed
- Can be as simple as the audit score or as sophisticated as the 100 metrics used by some banks (eg % of book daily independently reevaluated, % of system down time, age of systems)

Example of How KRD can be used to Adjust Op VaR

	Δ KRD %	Δ Op VaR %
	+20	−15
	+10	−10
Op VaR $_{LE}$	0	0
	−10	+15
	−20	+25

Is there an alternative to the scorecard approach to the Qualitative Adjustment or more precisely to incorporating the Δ BCE

Incorporating Scenario Analysis

actual PE = z_i PE_i + $z_e PE_e$ + $z_s PE_s$

Use the scenario involving the Δ BCE

- Business and Risk Management must estimate the effect of the Δ BCE on PE, LGE and γ

General OP VaR Methodology

WCL = Expected no of Losses *x* Average Loss *x* γ

= E_f x E_s *x* PE *x* LGE *x* γ

E_f x E_s = E = $(1-z_{le})E_h + z_{le} E_{le}$

E_h = *12 month average exposure*

E_{LE} = *latest estimate from BM Judgement*

Z_{le} *is from RM and BM Judgement*

$PE = z_h PE_h + z_e PE_e + z_{bce} PE_{bce}$

PE_h = *36 month average rate from internal loss experience*

PE_e = *36 month average rate from external loss experience*

Pe_{bce} = *Scenario analysis (RM and BM Judgement)*

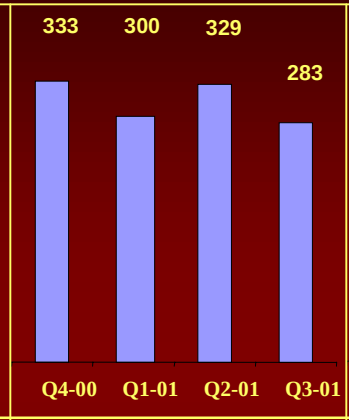
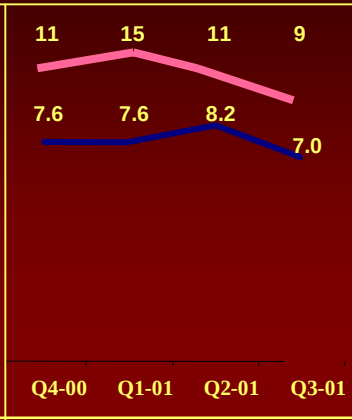
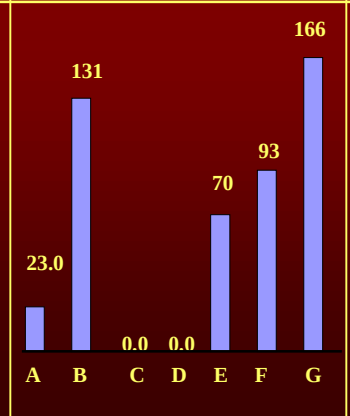
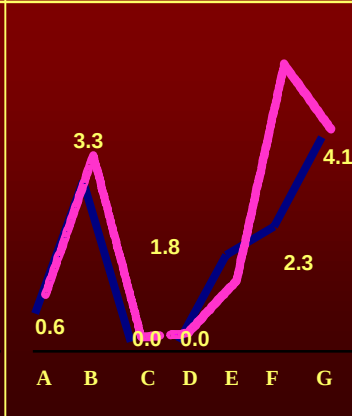
Z_h and Z_e Calculated using statistical credibility theory

Z_{bce} is from RM and BM Judgement

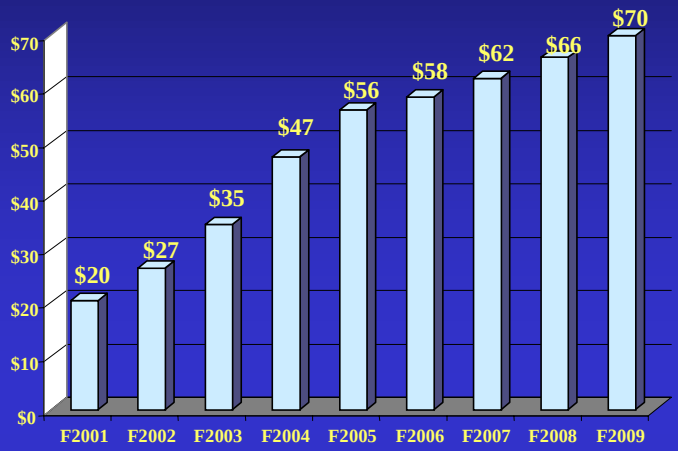
The *AMOR* Report

*A*nalysis and
*M*onitoring of
*O*perational
*R*isk

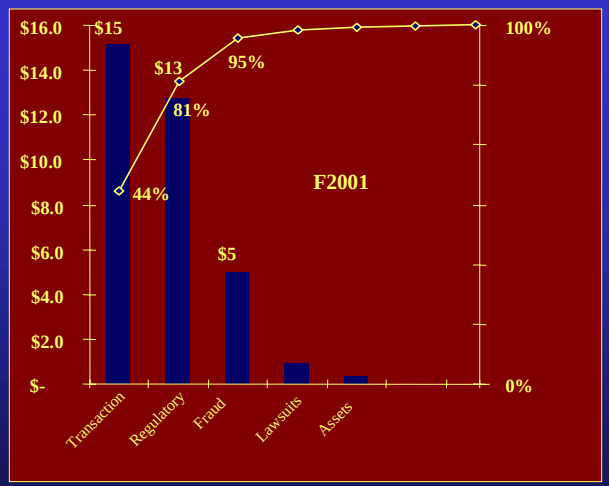
AMOR

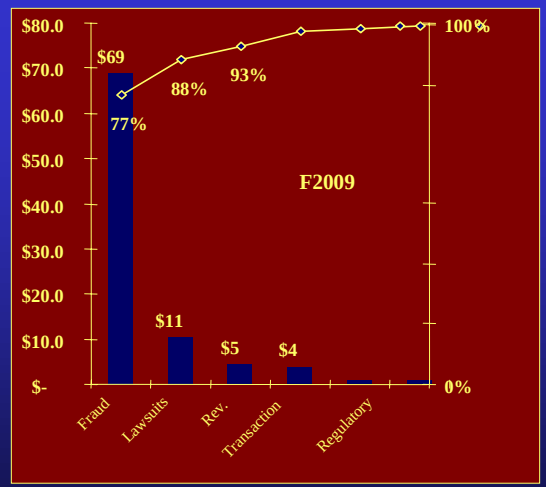
	OpVaRs ($MM)	OpVaR as % of Gross Income	Comentary
•SBU OP VaR			
•Q3-01 by Loss Types A. Client Restitution B. Legal liability Client C. Legal Liability Employee D. Loss and Damage to Assets E. Reg. Compliance Tax Penalties F. Theft Fraud Unauthorized Act. G. Transaction Processing			

Start up Op VaR



- OP VaR increases 2.5 times over 9 years compared to account balance growth 208 times:
  - Reduction in infrastructure build.
  - Reduction in fraud rates because of business maturing..
- Composition of Op VaR changes over the 9 year horizon
  - First year, 81% of risk is Transaction risk reflecting infrastructure (kiosks) build up
  - Ninth year, 77% of the risk is Theft and Fraud.
  - Historical Proxy losses rates have been used






CIBC

Decomposing Expected No Of Losses

Expected no of Losses can be decomposed into the a measure of the amount of the business activity that can gives rise to the loss and the propensity for losses given that activity.

- This allows comparison of operational risk over time, by separating out
  - how much of the change is due to the change in the amount of business activity and
  - how much is due to a change in the propensity for losses

- the measure of the amount of business activity should correlate with the number op expected operational risk losses, this measure is usually referred to as the frequency exposure and denoted as E_f
  - For example: in transaction risk, E_f may be total number of transaction processed

- the propensity for loss is the probability that business activity gives rise to a loss and is denoted by PE

Expected no of Losses = E_f x PE

Decomposing Average Loss

Average loss can be decomposed into the average of amount at risk per loss event and the percentage lost per loss event

- this allows the comparison of operational risk over time, by separating out
  - how much of the change is due to the change in the amount at risk per loss event and
  - how much is due to a change in the percentage lost per loss event
  - This decomposition is especially useful for risk management, when action ca

- the measure of the amount at risk should correlate with average loss per loss event, this measure is usually referred to as the severity exposure and denoted as E_s
  - For example: in transaction risk, E_s may be average value of transaction processed

- the percentage lost of the amount at risk per loss event is denoted by LGE (loss given event)

Average Loss = E_S x LGE